(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
17 May 2001 (17.05.2001)

PCT

(10) International Publication Number
WO 01/35676 A1

(51) International Patent Classification[7]: H04N 11/20, 7/00, 11/00, 7/16, 7/173, H04H 9/00

(21) International Application Number: PCT/IL00/00719

(22) International Filing Date:
5 November 2000 (05.11.2000)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
09/438,738 11 November 1999 (11.11.1999) US

(71) Applicant: CONTENTWISE LTD [IL/IL]; 5 Openheimer Street, Science Park, 76701 Rehovot (IL).

(72) Inventor: HERSHTIK, Asher; Mobile Post Dolevn, 71935 Modiin (IL).

(74) Agent: KORAKH, Eliav; Borochov, Korakh, Eliezri & Co., 15th floor, Atidim Tower, P.O. Box 58100, 61580 Tel Aviv (IL).

(81) Designated States *(national)*: AE, AG, AL, AM, AT, AT (utility model), AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, CZ (utility model), DE, DE (utility model), DK, DK (utility model), DM, DZ, EE, EE (utility model), ES, FI, FI (utility model), GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KR (utility model), KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK (utility model), SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

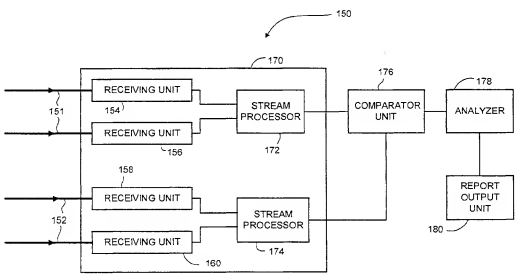
Published:

— *With international search report.*

— *Before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments.*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: METHOD AND SYSTEM FOR GLOBAL BROADCAST MONITORING



(57) Abstract: Method for monitoring multimedia streams including at least one reference stream (151) and at least one actual stream (152), the method including the steps of: comparing (176) between each respective ones of the reference stream and the actual stream, and comparing between selected non-respective of the reference stream and the actual stream.

WO 01/35676 A1

METHOD AND SYSTEM FOR GLOBAL BROADCAST MONITORING

FIELD OF THE INVENTION

The present invention relates to a method and a system for monitoring broadcast signals in general, and to methods and systems for global broadcast monitoring, in particular.

BACKGROUND OF THE INVENTION

Methods and systems for monitoring video streams and audio streams are known in the art. Methods for comparing between a received stream and a reference stream operate either on the original stream or on a derivative thereof. Such methods operate on either video streams, on audio streams or on combinations thereof, where the audio is timed with the video.

In US Patent 4,805,020, to Greenberg, entitled "Television program transmission verification method and apparatus" a method and apparatus are disclosed for verifying the proper airing of television programs. A digital identification code is recorded on a preselected scan line of a frame, this line being normally invisible to the television viewer. A plurality of television channels can be simultaneously monitored by a primary monitoring system and broadcast encoded programs are identified and timed. The identification information is stored locally for later comparison with centrally stored information specifying the programs that should have been aired.

In US Patent 5,436,653 to Ellis et al., entitled "Method and system for recognition of broadcast segments", there are disclosed methods and systems for broadcast segment recognition. In these methods a signature, representing a monitored broadcast segment, is compared with broadcast segment signatures in a data base representing known broadcast segments, to determine whether a match exists. Criteria for determining the validity of such a match are provided.

US Patent 4,945,412 to Kramer, entitled "Method of and system for identification and verification of broadcasting television and radio program segments" discloses a method of and system for identification and verification of broadcast television and/or radio program segments. The method uses subaudible codes, which are mixed with the conventional audio in the program segments. A plurality of radio/television broadcast stations are monitored, the codes recovered and data sets defined, stored and later sent to a central location for analysis. In the case of television stations, the video content of commercial message segments may be monitored.

In US Patent to Carles, entitled "System and method for selectively distributing commercial messages over a communications network" a device and method of distributing commercial messages to an individually addressable subscriber terminal on a network are disclosed. Commercial messages to be distributed over the network contain embedded information identifying categories of recipients for each message. A server, centrally located on the network, selectively tags commercial messages with the converter addresses of subscribers, satisfying the identifying categories. The commercial messages are then transmitted over the network for receipt and display by a television receiver connected to the addressed subscriber.

SUMMARY OF THE PRESENT INVENTION

It is an object of the present invention to provide a novel method and system for monitoring global broadcast transmissions, which overcomes the disadvantages of the prior art.

In accordance with the present invention, there is thus provided a method for monitoring multimedia streams. The multimedia streams include at least one reference stream and at least one actual stream. The method includes the steps of: comparing between each respective ones of the reference stream and the actual stream, and comparing between selected non-respective of the reference stream and the actual stream.

The method can further include the steps of receiving the reference stream and reference characteristic data, and receiving the actual stream and the actual characteristic data. Furthermore, the reference stream and the reference characteristic data are respective of the original reference media stream, and the actual stream. The actual characteristic data are respective of the original actual media stream.

The media can be video, audio, text, and the like. The selected non-respective reference stream and actual stream includes video and audio streams, video and text streams, or audio and text streams.

The method can further include the steps of: generating a respective media matching code, generating a characteristic data comparison table from the respective media matching code, and transmitting the characteristic data comparison table to a remote analyzer. The respective media matching code is indicative of the match results of the respective reference stream and of the actual stream.

The method can further include the steps of: generating a non-respective media matching code, generating a characteristic data comparison table from the non-respective media matching code, and transmitting the characteristic data comparison table to a remote

analyzer. The non-respective media matching code is indicative of the match results of the non-respective reference stream and of the actual stream.

In accordance with a further aspect of the present invention, there is thus provided a system for monitoring a multimedia switch. The multimedia switch includes a plurality of ports. The ports include input ports and output ports. The switch connects a selected input port to a selected output port. The system includes a media interface, which is connected to at least one of the ports, and a plurality of stream processors, which are connected to the media interface.

Each of the stream processors processes a media stream received from the media interface, thereby producing a stream derivative. The system can further include a comparator, which is connected to the stream processors. The system can further include a scheduler, which is connected to the comparator and to the media interface. The system can also include a storage unit, which is connected to the comparator.

The scheduler provides connection commands to the media interface, for connecting to the selected ports. The selected stream processors produce stream derivatives of streams, received from the selected ones of the ports. The comparator compares at least between portions of the stream derivatives, and respective portions of reference stream derivatives, thereby producing a matching code therebetween.

The reference stream derivatives are respective of the reference media streams. The storage unit contains at least one of the reference stream derivatives, and at least one of the reference media streams is received in a selected one of the input ports.

The system can further include a communication interface, connected to the scheduler, for connecting to a remote control station, thereby receiving scheduling commands therefrom. The communication

interface, is further connected to the comparator, for transmitting the matching code to the remote control station.

The system can also include a communication interface, connected to the comparator, for transmitting the matching code to the remote control station. At least one of the reference media streams includes a predetermined sequence. The predetermined sequence can be white noise, a blue screen, a video calibration image, and the like. The predetermined portion includes a still commercial logo. The predetermined portion may also include a dynamic commercial logo.

The system can further include a remote reporting unit. The remote reporting unit includes an input interface, a controller, and an output unit. The output unit can be a printer, a display, an audio output device, an odor production device, a tactile output device, and the like. The controller is connected to the input interface, and the output unit is connected to the controller.

In accordance with a further aspect of the present invention, there is thus provided a method for monitoring a multimedia switch. The multimedia switch includes a plurality of ports. The ports include input ports and output ports. The switch connects a selected input port to a selected output port.

The method includes the steps of: connecting to at least one of the ports, according to a predetermined schedule, receiving at least one media stream from the port, and producing a stream derivative from at least a portion of each of the media streams. The method can include an additional step of comparing between the stream derivative and a reference stream derivative, thereby producing a matching code therebetween.

The method can further include the steps of: receiving the predetermined schedule from a remote control station, transmitting the matching code to a remote control station, and selecting at least one received media stream as a reference media stream. The reference

stream derivative can be white noise, a blue screen, a video calibration image, and the like. The portion is directed at a predetermined screen location area. The reference stream derivative can be a still commercial logo, a dynamic commercial logo, and the like.

In accordance with another aspect of the present invention, there is thus provided a system for monitoring a multimedia switch. The multimedia switch includes a plurality of ports. The ports include input ports and output ports. The switch connects a selected input port to a selected output port. The system includes a plurality of media interfaces, a switching unit connected to the media interfaces, and a comparator connected to the switching unit. At least one of the media interfaces is connected to at least one of the output ports.

The switching unit connects the comparator to a selected one of the media interfaces, and the comparator receives a media stream from the output port connected to the selected media interface. The comparator compares between a portion of the media stream and a respective portion of a reference media stream, thereby producing a matching code.

The system can further include a storage unit, connected to the comparator. The storage unit stores the reference media stream. It is noted that in this case at least one of the media interfaces is connected to at least one of the input ports. The switching unit connects the comparator to a selected other of the media interfaces. The selected other of the media interfaces, is connected to an input port, and the comparator receives the reference media stream from the input port.

The system can further include a scheduling unit, connected to the switching unit, for initiating the switching unit at predetermined times.

The system can also include a communication interface, connected to the scheduling unit, for receiving scheduling instructions from a remote station. The system can also include a communication

interface, connected to the comparator, for transmitting the matching code to a remote station.

The system can also include a reporting unit, connected to the comparator, for analyzing the matching code, thereby producing a matching report analysis. The system can further include a communication interface, connected to the reporting unit, for transmitting the matching report analysis to a remote station.

The stream processor includes an input communication interface, a stream characteristic processor, and a video processor, which is connected between the input communication interface and the stream characteristic processor. The stream processor can further include an audio processor, connected between the input communication interface and the stream characteristic processor. The stream processor can also include a text stream bus unit, connected between the input communication interface and the stream characteristic processor, and an output communication interface connected to the stream characteristic processor. The stream processor can further include a storage unit, connected between the output communication interface and the stream characteristic processor.

In accordance with a further aspect of the present invention, there is thus provided a method for operating a stream processor. The method includes the steps of: receiving a plurality of streams, extracting stream data from each of the streams, transmitting the stream data to a remote comparator, and storing the stream data prior to transmitting. The streams, include at least one video stream, at least one audio stream, and at least one text stream. The stream data can be a stream signature, stream characteristic data, and the like. The step of extracting stream data from each of the streams can include extracting stream signature, extracting stream characteristic data, and the like.

In accordance with a further aspect of the present invention, there is thus provided a method for operating a remote stream

comparator. The method includes the steps of: receiving stream data from a first remote stream source, and receiving reference stream data from a second remote stream source. The method further includes the step of comparing between respective portions of the stream data and the reference stream data, thereby generating a respective stream matching code. The method can further include the step of comparing between non-respective portions of the stream data and the reference stream data, thereby generating a non-respective stream matching code.

The respective portions can be a video portion and a reference video portion, an audio portion and a reference audio portion, a text portion and a reference text portion, and the like. The non-respective portions can be a video portion and a reference audio portion, a video portion and a reference text portion, an audio portion and a reference text portion, an audio portion and a reference video portion, a text portion and a reference video portion, a text portion and a reference audio portion, and the like.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be understood and appreciated more fully from the following detailed description taken in conjunction with the drawings in which:

Figure 1 is an illustration of a worldwide broadcast system;

Figure 2 is a schematic illustration of a distributed monitoring system, constructed and operative in accordance with a preferred embodiment of the present invention;

Figure 3 is a schematic illustration of a method for operating the distributed monitoring system of Figure 2, operative in accordance with another preferred embodiment of the present invention;

Figure 4 is a schematic illustration of a receiving station, constructed and operative in accordance with a further preferred embodiment of the present invention;

Figure 5 is a schematic illustration of a stream processor, constructed and operative in accordance with another preferred embodiment of the present invention;

Figure 6 is a schematic illustration of a method for operating the stream processor of Figure 5, operative in accordance with a further preferred embodiment of the present invention;

Figure 7 is a schematic illustration of a comparator unit, constructed and operative in accordance with another preferred embodiment of the present invention;

Figure 8 is a schematic illustration of a method for operating the comparator unit of Figure 7, operative in accordance with a further preferred embodiment of the present invention;

Figure 9 is a schematic illustration of a plurality of data types, which can be provided to comparator unit of Figure 7, in accordance with another preferred embodiment of the present invention;

Figure 10 is a schematic illustration of the data type which is provided at the output of the comparator unit of Figure 7, in accordance with a further preferred embodiment of the present invention;

Figure 11 is a schematic illustration of a world wide broadcast system, incorporating the distributed monitoring system of Figure 2, operative in accordance with another preferred embodiment of the present invention;

Figure 12 is a schematic illustration of a reference stream distributor device, a plurality of local channels, a control station and a distribution monitoring system, constructed and operative in accordance with a further preferred embodiment of the present invention;

Figure 13 is a schematic illustration of the comparator unit of the distribution monitoring system of Figure 12, constructed and operative in accordance with another preferred embodiment of the present invention; and

Figure 14 is a schematic illustration of a method for operating the comparator unit of Figure 13, operative in accordance with a further preferred embodiment of the present invention.

DETAILED DESCRIPTION OF PREFFERED EMBODIMENTS

Reference is now made to Figure 1, which is an illustration of a worldwide broadcast system, generally referenced 2. System 2 includes a plurality of transmission stations 10 and 12, communication satellites 24, 26, 28 and 30, communication lines 32 and 34, receiving stations 36, 38, 40 and 42, local distribution stations 14 and 16 and end user receivers 18, 20 and 22. Communication lines 32 and 34 can be coaxial, optic fibers, and the like. It is noted that such a link can also include various segments, which are wireless such as directional microwave links, and the like.

Receiving station 36 is connected to transmission station 10 and to local distribution stations 14 and 16. Receiving station 36 is further connected to communication satellite 24, wirelessly. Receiving station 42 is connected to transmission station 12 and to local distribution station 14. Receiving station 42 is further connected to communication satellite 30, wirelessly. Receiving stations 38 and 40 are connected to the local distribution stations 14 and 16. Receiving stations 38 and 40 are further wirelessly connected to communication satellites 26 and 28 respectively. Local distribution station 16 is further connected to end user receivers 18 and 20. Distribution station 14 is connected further to end user receivers 18 and 22. Communication satellite 24 is connected wirelessly to transmission station 10 and to communication satellite 26. Communication satellite 26 is further wirelessly connected to receiving station 38 and to communication satellite 28. Communication satellite 30 is wirelessly connected to the receiving station 42, to the transmission station 12 and to the communication satellite 28. It is noted that additional communication links can be established between all the receiving stations using communication satellite connections.

Transmission stations 10 and 12 provide data streams to the receiving stations 36, 38, 40 and 42 using communication satellites 24,

26, 28 and 30 or communication lines 32 and 34. The data streams are provided by content providers such as BBC, CNN, Reuters, Associated Press (AP), and the like.

Receiving stations 36, 38, 40 and 42 transmit the streams further to local distribution stations 14 and 16. Local distribution stations 14 and 16 distribute the streams among end user receivers 18, 20 and 22.

Reference is now made to Figure 2, which is a schematic illustration of a distributed monitoring system, generally referenced 150, constructed and operative in accordance with another preferred embodiment of the present invention. System 150 includes a stream receiving section 170, a comparator unit 176, an analyzer 178 and a report output unit 180. The report output unit can be a printer, a display, an audio output device, an odor production device, a tactile output device, and the like.

Stream receiving section 170 includes a plurality of receiving units 154, 156, 158 and 160 and a plurality of stream processors 172 and 174.

Receiving units 154 and 156 are connected to stream processor 172. Receiving units 158 and 160 are connected to stream processor 174. Comparator unit 176 is connected to stream processors 172 and 174 and to analyzer 178, which is also connected to the report output unit 180.

Receiving units 154 and 156 receive reference streams 151 and transmit them at a predetermined time to stream processor 172. Receiving units 158 and 160 receive actual streams 152 and transmit them at a predetermined time to the stream processor 174. Stream processor 172 generates reference stream signatures and characteristic data vectors and provides them to comparator unit 176. Stream processor 174 generates actual stream signatures and characteristic data vectors and provides them to comparator unit 176. Comparator unit

176 generates signature matching codes and characteristic data comparison tables and transmits this information to an analyzer 178.

Analyzer 178 performs a predetermined analysis of the comparator output data and displays the results on a report output unit 180. Such an analysis includes identification of certain programs of content providers and their competitors, statistical analysis, determination of program ratings, timing, volume, and the like.

Stream content verification and comparison includes the steps of extracting frame characteristic data streams from a first, reference content and a second, actual content, and comparing the first and the second streams on a frame-by-frame basis. This procedure is described in detail in European Patent Application EP 0 838 960 A2 to Wilf et al., entitled "System and method for audio-visual content verification", which is hereby incorporated by reference.

Reference is further made to Figure 3, which is a schematic illustration of a method for operating the distributed monitoring system 150 (Figure 2), operative in accordance with a further preferred embodiment of the present invention.

In step 222, reference and actual streams are received and converted. With reference to Figure 2, receiving units 154 and 156 receive reference streams 151 and receiving units 158 and 160 receive actual streams 152. The receiving units 154, 156, 158 and 160 convert the reference and actual streams in a predetermined way and provide them to respective stream processors 172 and 174.

In step 224, the reference and actual streams are processed and signatures and characteristic data for each type of the streams are generated therefrom. With reference to Figure 2, stream processor 172 processes the reference stream and generates the signatures and characteristic data vector for the reference streams. Stream processor 174 processes the actual stream and generates the signatures and characteristic data vector for the actual streams.

In step 226, the reference and actual stream signatures and characteristic data are transmitted to a plurality of comparator units. With reference to Figure 2, stream processors 172 and 174 transmit the reference and actual stream signatures and characteristic data vectors, to the input of the comparator unit 176.

In step 228, each type of reference and actual sets of signatures and characteristic data are compared, and an output data is generated thereby. With reference to Figure 2, comparator unit 176 performs comparison between each type of reference and actual sets of signatures and characteristic data vectors and generates a set of output data. More detailed description of input and output data will be given below.

In step 230, the output data is transmitted to analyzer 178. With reference to Figure 2, comparator unit 176 transmits the output data to analyzer 178.

In step 232, the output data is analyzed and a final report is generated. With reference to Figure 2, analyzer 178 performs the analysis of received data to generate a final report. It is noted that methods of analysis and its output depend on requirements and objectives of content providers.

Reference is further made to Figure 4, which is a schematic illustration of a receiving unit, generally referenced 190, constructed and operative in accordance with another preferred embodiment of the present invention. System 190 includes communication interfaces 192 and 198, a receiver 194 and a storage device 196.

Receiver 194 is connected to communication interface 192 and to storage device 196, which is further connected to communication interface 198.

Receiver 194 receives a reference or an actual data stream via the input communication interface 192. The receiver 194 can convert the incoming stream into a digital or compressed form. The receiver

stores the converted stream in storage device 196. Stream processor 172 (Figure 2), retrieves the stream from storage device 196 via output communication interface 198.

Reference is further made to Figure 5, which is a schematic illustration of a stream processor, generally referenced 200, constructed and operative in accordance with a further preferred embodiment of the present invention. Stream processor 200 includes communication interfaces 214 and 212, a video processor 202, an audio processor 204, a text stream bus unit 206, a stream characteristic processor 208 and a storage device 210.

Video processor 202, audio processor 204 and text stream bus unit 206, are connected to communication interface 214 and to stream characteristic processor 208. Storage device 210 is connected to stream characteristic processor 208 and to communication interface 212.

Communication interface 214 provides reference or actual streams from the at least one of the receiving units (Figure 2) to video processor 202, to audio processor 204 and to stream characteristic processor 208 via text stream bus unit 206. Video processor 202 extracts video information from the video stream and provides this information to stream characteristic processor 208. Audio processor 204 extracts audio information from the audio stream and provides that information to stream characteristic processor 208. Stream characteristic processor 208 generates video stream signatures, audio stream signatures, text stream signatures and characteristic data vectors and stores them in storage device 210. Communication interface 212 transmits the stream signatures and characteristic data vectors to comparator unit 176 (Figure 2).

Reference is further made to Figure 6, which is a schematic illustration of a method for operating stream processor 190 (Figure 5),

operative in accordance with another preferred embodiment of the present invention.

In step 234, a plurality of input streams is received. With reference to Figure 5, communication interface 214 receives a plurality of input streams from a plurality of receiving units such as references 154, 156, 158 and 160 (Figure 2).

In step 236, the video, audio and text streams are processed. Thereby, signatures and characteristic data for each of the data types are generated therefrom. With reference to Figure 5, processors 202, 204, 206 and 208 process the video, audio and text streams. Stream characteristic processor 208 generates signatures and characteristic data vectors for each of the data types.

In step 238, the signatures and characteristic data are stored in a storage device. With reference to Figure 5, stream characteristic processor 208 stores the results in the storage device 210. It is noted that the same processing method is applicable for both reference and actual input streams. It is further noted that detailed description of operation method for signature and characteristic data vector generating, is disclosed in the European Patent Application EP 0 838 960 A2 to Wilf et al.

In step 240, the data stored in the storage device is transmitted to the comparator. With reference to Figure 5, communication interface 212 retrieves the stream signatures and characteristic data vectors from the storage device 210 and transmits them to the comparator unit 176 (Figure 2).

Reference is further made to Figure 7, which is a schematic illustration of a comparator unit, generally referenced 220, constructed and operative in accordance with a further preferred embodiment of the present invention.

Comparator unit 220 includes communication interfaces 222 and 226 and a comparator 224. Comparator 224 is connected to communication interfaces 222 and 226.

Communication interface 222 receives reference and actual stream signatures and characteristic data from the plurality of stream processors 172 and 174 (Figure 2). Communication interface 222 further provides this data to comparator 224.

Comparator 224 compares between respective reference and actual stream signatures and characteristic data, and generates an output data. The structure and content of the output data is described in detail below, in conjunction with Figure 10. Communication interface 226 transmits further the output data to analyzer 178 (Figure 2).

Reference is further made to Figure 8, which is a schematic illustration of a method for operating comparator unit 220 (Figure 7), operative in accordance with another preferred embodiment of the present invention.

In step 242, signatures and characteristic data of video, audio and text reference streams are received. With reference to Figure 7, communication interface 222 receives reference signatures and characteristic data, provided at the output of stream processor 172 (Figure 2). The communication interface 222 further provides the reference signatures and characteristic data to comparator 224 (Figure 7).

In step 244, signatures and characteristic data of video, audio and text of actual streams are received. With reference to Figure 7, communication interface 222 receives reference signatures and characteristic data, provided at the output of stream processor 174 (Figure 2). The communication interface 222 further provides the actual signatures and characteristic data to comparator 224.

In step 246, a comparison, between each reference and the actual signatures, is performed. With reference to Figure 7, comparator

224 compares between each of the reference and actual video signatures, between reference and actual audio, as well as between reference and actual text signatures.

In step 248, video-to-video, audio-to-audio and text-to-text signature matching codes, are generated. With reference to Figure 7, comparator 224 generates video-to-video, audio-to-audio and text-to-text signature matching codes. This type of signature matching code is further used to analyze the matching between the actual and reference video, audio or text streams.

In step 250, video-to-audio, video-to-text and audio-to-text matching codes, are generated. With reference to Figure 7, comparator 224 generates video-to-audio, video-to-text and audio-to-text matching codes. This type of signature matching code, is used to detect predetermined events. For example, such an event can include a video stream related to the first segment of a reference stream in combination with an audio and/or text stream related to the second segment of a reference stream. In an additional example, a reference video stream provided by CNN to Japan is combined there with audio and text streams in Japanese and transmitted further as an actual stream.

In step 252, a characteristic data comparison table is generated. With reference to Figure 7, comparator 224 generates the characteristic data comparison table. This table is used further for the analysis of the broadcast content, rating, volume, timing and the like. For example, a characteristic data comparison table for a video stream can be of the form:

Table 1

Reference video stream	Actual video stream		
	Date	Time	Duration
Date	0		
Time		0	

Duration			-10

The zero values in date-to-date and time-to-time cells denote that reference and actual streams were transmitted at the same time. The value –10 in the duration-to-duration cell denotes that the duration of the actual stream was less than 10 minutes.

In step 254, the output data is transmitted for further analysis. With reference to Figure 7, comparator 224 transmits video-to-video, audio-to-audio and text-to-text matching codes, as well as video-to-audio, video-to-text and audio-to-text matching codes, via communication interface 226 (Figure 7), to analyzer 178 (Figure 2). Comparator 224 further transmits the characteristic data comparison table (Table 1) via communication interface 226 (Figure 7) to analyzer 178 (Figure 2).

Reference is further made to Figure 9, which is a schematic illustration of a plurality of data types, generally referenced 260, 262, 264 and 266, which can be provided to comparator 224 (Figure 7), in accordance with a further preferred embodiment of the present invention. The reference data types are provided at the output of reference stream processor 172 (Figure 2). The actual data types are provided at the output of actual stream processor 174 (Figure 2). Each of the data types consists of stream signatures and characteristic data. The structure of the video reference characteristic data (reference 260) is identical to the structure of the audio and text reference characteristic data (reference 264). The reference characteristic data includes a plurality of parameters, which can be a time/date marker, a provider ID, a stream duration, an initial rating, a content code, and the like.

The time/date marker indicates the time and date of broadcast of the reference stream. This information is used for the calculation of a time shift between reference and actual streams, when a match is detected there between.

The provider ID identifies the content provider of a specific reference stream. This data is used, for example, for identifying a section of the stream of the first content provider Associated Press (AP) which was detected within the broadcast of the second content provider (for example - CNN). The stream duration shows the duration in seconds or minutes of the reference stream. It is noted that in accordance with another aspect of the invention, the provider ID can be extracted from the stream itself, since it is usually presented at a predetermined location within the video stream, conventionally at the upper right/left corners of the image.

The initial rating parameter reflects the relative importance of the stream as per definition of the content provider. For example, the rating of "breaking news" stream or some live sports events may be much higher than the rating of an "educational" stream.

The content code data possesses the information about the stream content. It can include, for example, such categories as live events, sports, business, war, archive, and the like.

The structure of the video actual characteristic data (reference 262) includes a plurality of parameters, which can be a time/date marker, a provider ID, a duration, a channel ID and the like. The first four of parameters have the same meaning as above.

The channel ID parameter identifies the transmission channel and may include transmission frequency value, country ID, broadcast format, and the like.

The structure of the audio/text actual characteristic data (reference 266) differs from the video actual in that it can include additional parameters, such as language. This parameter identifies a language of the actual audio/text stream, which is a useful input for the further statistical analysis.

It is noted that the set of characteristic data mentioned above is exemplary. Additional parameters can be added or some of the listed parameters can be removed or replaced.

Reference is further made to Figure 10, which is a schematic illustration of the data type which is provided at the output of the comparator unit 220, (Figure 7), in accordance with another preferred embodiment of the present invention.

The output data includes a plurality of parameters, which can be video-to-video, audio-to-audio and text-to text signature matching codes, a video-to-audio matching code, a video-to-text matching code and an audio-to-text matching code and the like. The output data can further include video, audio and text time shift values and a characteristic data comparison table.

The video-to-video, audio-to-audio and text-to text signature matching codes can be used for verifying of and comparing between, the reference and actual video, audio and text streams, respectively. The video-to-audio, video-to-text, and audio-to-text matching codes can be employed for detecting and identifying the cases when, for example, a video segment from the first stream is transmitted together with an audio or text segment from the second stream. This occurs, for example, when a local distributor transmits an "archive" video stream together with "live event" audio and/or text stream or vice versa.

The video, audio and text time shift values and characteristic data comparison table, provide the information for the further analysis by the analyzer 178 (Figure 2) as described above.

According to one aspect of the invention, each of the different units of the distributed monitoring system 150 (Figure 2), such as the receiving units, the stream processors, the comparator units, and like is generally located at different places. These locations can include Earth surface, satellites, and the like.

Reference is further made to Figure 11, which is a schematic illustration of a world wide broadcast system, generally referenced 100, incorporating the distributed monitoring system 150 (Figure 2), operative in accordance with a further preferred embodiment of the present invention. System 100 includes a plurality of transmission stations 106 and 116, communication satellites 102, 104, 112 and 114, communication lines 132 and 134, receiving stations 108, 110, 118 and 120, stream processors 172 and 174, comparator units 176A and 176B and analyzer 178. Communication lines 132 and 134 can be coaxial, optic fibers, and the like. It is noted that such a link can also include various segments, which are wireless such as directional microwave links, and the like. Comparator units 176A and 176B, are generally similar to comparator unit 176.

Receiving unit 108 is connected to transmission station 106 and to stream processor 172. Receiving unit 108 is further connected to communication satellite 102, wirelessly. Receiving unit 120 is connected to transmission station 116 and to stream processor 174. Receiving unit 120 is further connected to communication satellite 114, wirelessly. Receiving units 110 and 118 are connected to stream processors 172 and 174. Receiving units 110 and 118 are further wirelessly connected to communication satellites 104 and 112, respectively. Stream processor 172 is further connected to comparator unit 176A. Stream processor 174 is further connected to comparator unit 176B. Comparator units 176A and 176B are connected to analyzer 178. Communication satellite 102 is connected to transmission station 106 via receiving station 108. The communication between receiving station 108 and communication satellite 102 is wireless. Satellite 102 is further wirelessly connected to communication satellite 104. Communication satellite 104 is further wirelessly connected to receiving station 110 and to communication satellite 112. Communication satellite 114 is connected to transmission station 116 via receiving station 120. The

communication between receiving station 120 and communication satellite 114 is wireless. Satellite 114 is further wirelessly connected to the communication satellite 112. It is noted that additional communication links can be established between all of the receiving stations using communication satellite connections.

Transmission stations 106 and 116 provide a plurality of reference and actual data streams to the receiving stations 108, 110, 118, and 120, using communication satellite 102, 104, 112 and 114 or communication links 132 and 134. The reference data streams are provided by content providers such as BBC, CNN, Reuters, AP, and the like.

Each of the receiving stations 108, 110, 118 and 120 receives a number of streams and transmits them further, to at least one of stream processors 172 and 174. Stream processors 172 and 174 extract video, audio and text signatures and characteristic data from the reference and actual streams, and transmit the extracted data to comparator units 176A and 176B.

Each of comparator units 176A and 176B compares respective reference and actual data and generates matching codes and characteristic data tables. Comparator units 176A and 176B transmit the matching codes and the characteristic data table to analyzer 178 for the final analysis and output report generation.

In accordance with another aspect of the present invention, there is provided a system and a method for monitoring of reference stream distribution among end users.

Reference is now made to Figure 12, which is a schematic illustration of a reference stream distributor device, generally referenced 290, a plurality of local channels, generally referenced 302A, 302B, 302C and 302D, a control station, generally referenced 324 and a distribution monitoring system, generally referenced 300, constructed

and operative in accordance with another preferred embodiment of the present invention.

Distribution monitoring system 300 includes stream selectors 304 and 306 and a comparator unit 332. Stream distributor 290 is connected to stream selectors 304 and 306 and to local channels 302A, 302B, 302C and 302D. Comparator unit 332 is connected to stream selectors 304 and 306 and to control station 324.

Stream distributor 290 receives a plurality of reference streams 334A, 334B, 334C and 334D. Stream distributor 290 further distributes the reference streams in accordance with a predetermined schedule, among the plurality of local channels 302A, 302B, 302C and 302D. For example, CNN news are transmitted at 20:00 via the content channel 334B and are distributed to local channel 302A. At 20:30 a sport program is transmitted via the content channel 334D to local channel 302A.

Stream selector 304 receives the same plurality of the reference streams which stream distributor 290 receives. Stream selector 306 receives the same plurality of actual streams which local channels 302A, 302B, 302C and 302D receive.

Selector 304 selects, in accordance with a predetermined schedule, at least one of the reference streams, which are provided to stream distributor 290. Selector 306 selects, in accordance with a predetermined schedule, at least one of the actual streams from the output of stream distributor 290. Selectors 304 and 306 further transmit selected reference and actual streams to comparator unit 332.

Comparator unit 332 receives the reference streams from stream selector 304 and the actual streams from stream selector 306. Comparator unit 332 further compares between the two streams and verifies that the appropriate reference streams are distributed to end user receivers 302A, 302B, 302C and 302D, in accordance with the

predetermined schedule. Finally, distribution monitoring system 300 generates a matching code and transmits it to control station 324.

Reference is further made to Figure 13, which is a schematic illustration of the comparator unit of Figure 12, generally referenced 332, constructed and operative in accordance with a further preferred embodiment of the present invention. Comparator unit 332 includes communication interfaces 316 and 328, a storage unit 330, two stream processors 318 and 320, a comparator 322 and a scheduler 326.

Stream processors 318 and 320 are each connected to communication interface 316 and to comparator 322. Comparator 322 is further connected to storage unit 330, and to communication interface 328. Communication interfaces 316 and 328 are interconnected via scheduler 326. Scheduler 326 initiates an operation of comparator unit 332 in accordance with a predetermined schedule. Communication interface 316 receives the reference streams from stream selector 304 (Figure 12) and the actual streams from stream selector 306 (Figure 12) and provides them further to stream processors 318 and 320, respectively. Stream processors 318 and 320 generate respective stream signatures of the reference and actual streams and provide these stream signatures to comparator 322. Comparator 322 compares between the stream signatures and generates a matching code. Comparator 322 provides the matching code to control station 324 (Figure 12), via communication interface 328.

In general, control station 324 (Figure 12) not only receives matching codes from comparator unit 332, but also generates commands therefor. The commands from control station 324 can change, for example, a time-schedule according to which, distribution monitoring system 300 performs the reference stream distribution monitoring.

It is noted, that any of a plurality of methods for generating signatures and comparing between them, which are known in the art,

are applicable to the present invention, such as the methods provided by European Patent Application EP 0 838 960 A2 to Wilf et al., or by US patent 4,739,398 to Thomas et al. In accordance with a further aspect of the invention, stream processors 318 and 320 perform minor operations on the received streams, and do not change them substantially. According to this aspect, the comparator 322 compares between the streams themselves and not respective signatures thereof.

Storage unit 330 stores signatures of predetermined streams such as blue screen, white noise, video calibration images, and the like. It is noted that storage unit 330 can further be used for intermediate storage location of the comparator 322.

Reference is further made to Figure 14, which is a schematic illustration of a method for operating comparator unit 332 (Figure 13), operative in accordance with another preferred embodiment of the present invention.

In step 346, scheduler 326 initiates the operation of comparator unit 332, according to a predetermined schedule. With reference to Figure 13, scheduler 326 sends control signals to stream selectors 304 and 306 (Figure 12).

In step 348, a predetermined reference stream is selected. With reference to Figure 12, stream selector 304 selects a predetermined reference stream from the plurality of reference streams at the inputs of stream distributor 290.

In step 350, a predetermined actual stream is selected. With reference to Figure 12, stream selector 306 selects a predetermined actual stream from the plurality of actual streams at the outputs of stream distributor 290.

In step 352, stream processor 318 receives the selected reference stream. With reference to Figure 13, communication interface 316 receives the reference stream provided at the output of stream

selector 304. Communication interface 316 transmits the reference stream further to stream processor 318.

In step 354, stream processor 320 receives the selected actual stream. With reference to Figure 13, communication interface 316 receives the actual stream provided at the output of stream selector 304. Communication interface 316 transmits the actual stream further to stream processor 320.

In step 356, a reference stream signature is extracted from the reference stream. With reference to Figure 13, stream processor 318 extracts the reference stream signature from the reference stream. Stream processor 318 provides further the reference stream signature to comparator 322.

In step 358, an actual stream signature is extracted from the actual stream. With reference to Figure 13, stream processor 320 extracts the actual stream signature from the actual stream. Stream processor 320 provides further the actual stream signature to comparator 322.

In step 360, a match between the reference stream signature and the actual stream signature is verified. With reference to Figure 13, comparator 322 compares between the reference stream signature and the actual stream signature. Comparator 322 further indicates the presence or absence of the match between reference stream signature and actual stream signature.

In step 362, a matching code is generated. With reference to Figure 13, comparator 322 generates a matching code. A matching code generally includes an indication about the presence or absence of the match between reference stream signature and actual stream signature and other relevant information.

In step 364, the matching code is transmitted to control station 324. With reference to Figure 13, comparator 322 transmits the

matching code to control station 324 via the communication interface 328 for further analysis and control.

It will be appreciated by persons skilled in the art that the present invention is not limited to what has been particularly shown and described here in above. Rather the scope of the present invention is defined only by the claims, which follow.

CLAIMS

1. Method for monitoring multimedia streams, the multimedia streams including at least one reference stream and at least one actual stream, the method comprising the steps of:

   comparing between each respective said at least one reference stream and said at least one actual stream; and

   comparing between selected non-respective said at least one reference stream and said at least one actual stream.

2. The method according to claim 1, further comprising the step of receiving at least one reference stream and reference characteristic data.

3. The method according to claim 1, further comprising the step of receiving at least one actual stream and actual characteristic data.

4. The method according to claim 2, wherein said at least one reference stream and reference characteristic data are respective of at least one original reference media stream.

5. The method according to claim 3, wherein said at least one actual stream and actual characteristic data are respective of at least one original actual media stream.

6. The method according to claim 1, wherein said media is selected from the list consisting of:

   video;

   audio; and

   text.

7. The method according to claim 1, wherein said selected non respective said at least one reference stream and said at least one actual stream comprise video and audio streams.

8. The method according to claim 1, wherein said selected non respective said at least one reference stream and said at least one actual stream comprise video and text streams.

9. The method according to claim 1, wherein said selected non respective said at least one reference stream and said at least one actual stream comprise audio and text streams.

10. The method according to claim 1, further comprising the step of generating a respective media matching code, said respective media matching code being indicative of the match results of said respective said at least one reference stream and said at least one actual stream.

11. The method according to claim 10, further comprising the step of generating a characteristic data comparison table from said respective media matching code.

12. The method according to claim 11, further comprising the step of transmitting said characteristic data comparison table to a remote analyzer.

13. The method according to claim 1, further comprising the step of generating a non-respective media matching code, said non-respective media matching code being indicative of the match results of said non-respective said at least one reference stream and said at least one actual stream.

14. The method according to claim 13, further comprising the step of generating a characteristic data comparison table from said non-respective media matching code.

15. The method according to claim 14, further comprising the step of transmitting said characteristic data comparison table to a remote analyzer.

16. System for monitoring a multimedia switch, the multimedia switch including a plurality of ports, said ports including input ports and output ports, the switch connecting a selected input port to a selected output port, the system comprising:

a media interface, connected to at least one of said ports;

a plurality of stream processors, connected to said media interface, each said stream processor processing a media stream received from said media interface, thereby producing a stream derivative;

a comparator, connected to said stream processors;

a scheduler, connected to said comparator and said media interface; and

a storage unit, connected to said comparator,

wherein said scheduler provides connection commands to said media interface, for connecting to selected ports, selected said stream processors producing stream derivatives of streams received from said selected ones of said ports, said comparator comparing at least between portions of said stream derivatives and respective portions of reference stream derivatives, thereby producing a matching code therebetween, and

wherein said reference stream derivatives are respective of reference media streams.

17. The system according to claim 16, wherein said storage unit contains at least one of said reference stream derivatives.

18. The system according to claim 16, wherein at least one of said reference media streams is received in a selected one of said input ports.

19. The system according to claim 16, further comprising a communication interface, connected to said scheduler, for connecting to a remote control station, thereby receiving scheduling commands therefrom.

20. The system according to claim 19, wherein said communication interface, is further connected to said comparator, for transmitting said matching code to said remote control station.

21. The system according to claim 16, further comprising a communication interface, connected to said comparator, for transmitting said matching code to said remote control station.

22. The system according to claim 16, wherein at least one of said reference media streams comprises a predetermined sequence.

23. The system according to claim 22, wherein said predetermined sequence is selected from the list consisting of:

white noise;

a blue screen; and

a video calibration image.

24. The system according to claim 16, wherein said predetermined portion includes a still commercial logo.

25. The system according to claim 16, wherein said predetermined portion includes a dynamic commercial logo.

26. The system according to claim 16, further comprising a remote reporting unit, said remote reporting unit including:

an input interface;

a controller, connected to said input interface; and,

an output unit, connected to said controller.

27. The system according to claim 26, wherein said output unit includes at least one of the list consisting of:

a printer;

a display;

an audio output device;

an odor production device; and

a tactile output device.

28. Method for monitoring a multimedia switch, the multimedia switch including a plurality of ports, the ports including input ports and output ports, the switch connecting a selected input port to a selected output port, the method comprising the steps of:

connecting to at least one of said ports, according to a predetermined schedule;

receiving at least one media stream from said at least one port;

producing a stream derivative from at least a portion of each said at least one media stream; and

comparing between said stream derivative and a reference stream derivative, thereby producing a matching code therebetween.

29. The method according to claim 28, further comprising the step of receiving said predetermined schedule from a remote control station.

30. The method according to claim 28, further comprising the step of transmitting said matching code to a remote control station.

31. The method according to claim 28, further comprising the step of selecting at least one received media stream as a reference media stream.

32. The method according to claim 28, wherein said reference stream derivative is selected from the list consisting of:
white noise;
a blue screen; and
a video calibration image.

33. The method according to claim 28, wherein said portion is directed at a predetermined screen location area.

34. The method according to claim 33, wherein said reference stream derivative is selected from the list consisting of:
a still commercial logo; and
a dynamic commercial logo.

35. System for monitoring a multimedia switch, the multimedia switch including a plurality of ports, the ports including input ports and

output ports, the switch connecting a selected input port to a selected output port, the system comprising:

a plurality of media interfaces, at least one of said media interfaces being connected to at least one of said output ports;

a switching unit connected to said media interfaces; and

a comparator connected to said switching unit.

36. The system according to claim 35, wherein said switching unit connects said comparator to a selected one of said media interfaces, said comparator receives a media stream from said output port connected to said selected media interface, said comparator comparing at least a portion of said media stream with a respective portion of a reference media stream, thereby producing a matching code.

37. The system according to claim 36, further comprising a storage unit, connected to said comparator, said storage unit storing said reference media stream.

38. The system according to claim 36, wherein at least one of said media interfaces is connected to at least one of said input ports; wherein said switching unit connects said comparator to a selected other of said media interfaces, being connected to said input port, said comparator receives said reference media stream from said input port.

39. The system according to claim 35, further comprising a scheduling unit, connected to said switching unit, for initiating said switching unit at predetermined times.

40. The system according to claim 39, further comprising a communication interface, connected to said scheduling unit, for receiving scheduling instructions from a remote station.

41. The system according to claim 36, further comprising a communication interface, connected to said comparator, for transmitting said matching code to a remote station.

42. The system according to claim 36, further comprising a reporting unit, connected to said comparator, for analyzing said matching code, thereby producing a matching report analysis.

43. The system according to claim 42, further comprising a communication interface, connected to said reporting unit, for transmitting said matching report analysis to a remote station.

44. Stream processor comprising:

an input communication interface;

a stream characteristic processor;

a video processor, connected between said input communication interface and said stream characteristic processor;

an audio processor, connected between said input communication interface and said stream characteristic processor;

a text stream bus unit, connected between said input communication interface and said stream characteristic processor; and

an output communication interface connected to said stream characteristic processor.

45. The stream processor, according to claim 44, further comprising a storage unit, connected between said output communication interface and said stream characteristic processor.

46. Method for operating a stream processor comprising the steps of:

receiving a plurality of streams, including at least one video stream, at least one audio stream and at least one text stream;

extracting stream data from each said streams; and

transmitting said stream data to a remote comparator.

47. The method according to claim 46 further comprising the step of storing said stream data prior to said step of transmitting.

48. The method according to claim 46 wherein said stream data includes at least one of the list consisting of:

stream signature; and

stream characteristic data.

49. The method according to claim 46 wherein said step of extracting stream data from each said streams includes at least one of the list consisting of:

extracting stream signature; and

extracting stream characteristic data.

50. Method for operating a remote stream comparator, comprising the steps of:

receiving stream data from a first remote stream source;

receiving reference stream data from a second remote stream source;

comparing between respective portions of said stream data and said reference stream data, thereby generating a respective stream matching code; and

comparing between non-respective portions of said stream data and said reference stream data, thereby generating a non-respective stream matching code.

51. The method according to claim 50, wherein said respective portions include at least one of the list consisting of:

a video portion and a reference video portion;

an audio portion and a reference audio portion; and

a text portion and a reference text portion.

52. The method according to claim 50, wherein said non-respective portions include at least one of the list consisting of:

a video portion and a reference audio portion;

a video portion and a reference text portion;

an audio portion and a reference text portion;

an audio portion and a reference video portion;

a text portion and a reference video portion; and

an text portion and a reference audio portion.

53. The method according to any of the claims 1-15 substantially as described herein above.

54. The method according to any of the claims 1-15 substantially as illustrated in any of the drawings.

55. A system according to any of the claims 16-27 substantially as described herein above.

56. A system according to any of the claims 16-27 substantially as illustrated in any of the drawings.

57. A method according to any of the claims 28-34 substantially as described herein above.

58. A method according to any of the claims 28-34 substantially as illustrated in any of the drawings.

59. A system according to any of the claims 35-43 substantially as described herein above.

60. A system according to any of the claims 35-43 substantially as illustrated in any of the drawings.

61. A stream processor according to any of the claims 44-45 substantially as described herein above.

62. A stream processor according to any of the claims 44-45 substantially as illustrated in any of the drawings.

63. A method according to any of the claims 46-49 substantially as described herein above.

64. A method according to any of the claims 46-49 substantially as illustrated in any of the drawings.

65. A method according to any of the claims 50-52 substantially as described herein above.

66. A method according to any of claims 50-52 substantially as illustrated in any of the drawings.

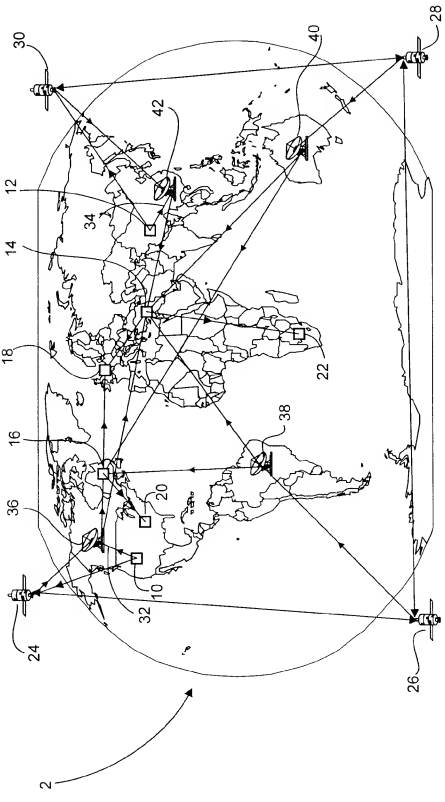


Fig. 1

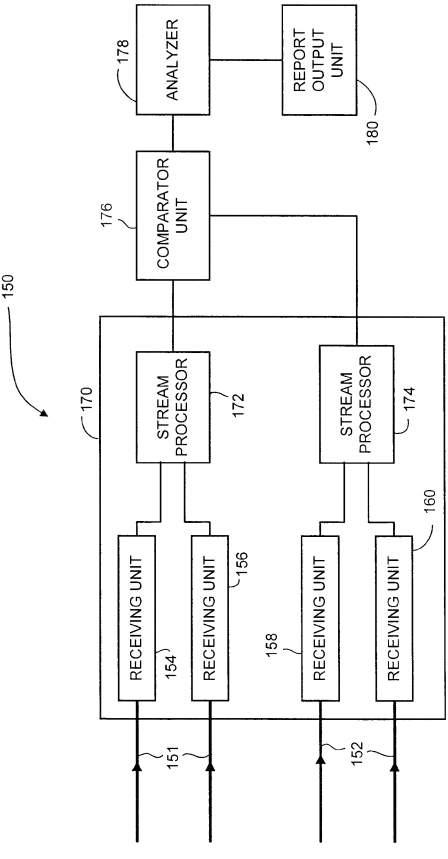

150
170
RECEIVING UNIT
154
RECEIVING UNIT
156
STREAM PROCESSOR
172
158
RECEIVING UNIT
RECEIVING UNIT
160
STREAM PROCESSOR
174
151
152
176
COMPARATOR UNIT
178
ANALYZER
REPORT OUTPUT UNIT
180

FIG. 2

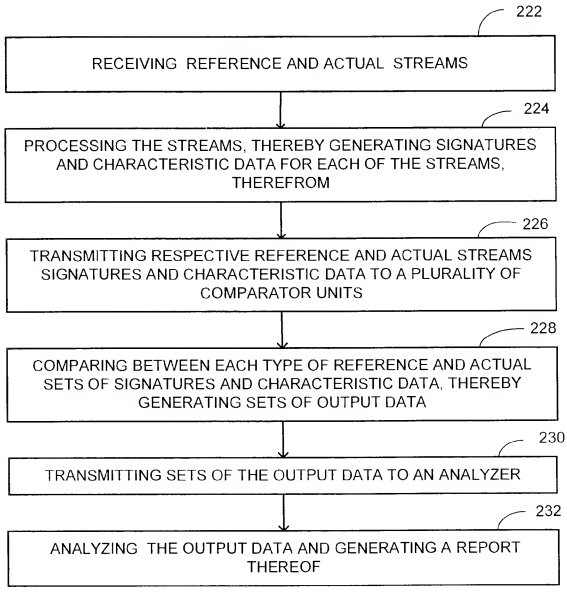

222
RECEIVING REFERENCE AND ACTUAL STREAMS
224
PROCESSING THE STREAMS, THEREBY GENERATING SIGNATURES AND CHARACTERISTIC DATA FOR EACH OF THE STREAMS, THEREFROM
226
TRANSMITTING RESPECTIVE REFERENCE AND ACTUAL STREAMS SIGNATURES AND CHARACTERISTIC DATA TO A PLURALITY OF COMPARATOR UNITS
228
COMPARING BETWEEN EACH TYPE OF REFERENCE AND ACTUAL SETS OF SIGNATURES AND CHARACTERISTIC DATA, THEREBY GENERATING SETS OF OUTPUT DATA
230
TRANSMITTING SETS OF THE OUTPUT DATA TO AN ANALYZER
232
ANALYZING THE OUTPUT DATA AND GENERATING A REPORT THEREOF

FIG. 3

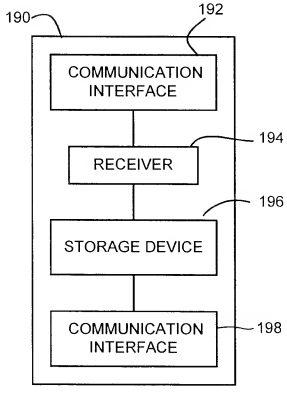

190
192
COMMUNICATION INTERFACE
194
RECEIVER
196
STORAGE DEVICE
COMMUNICATION INTERFACE
198

Fig. 4

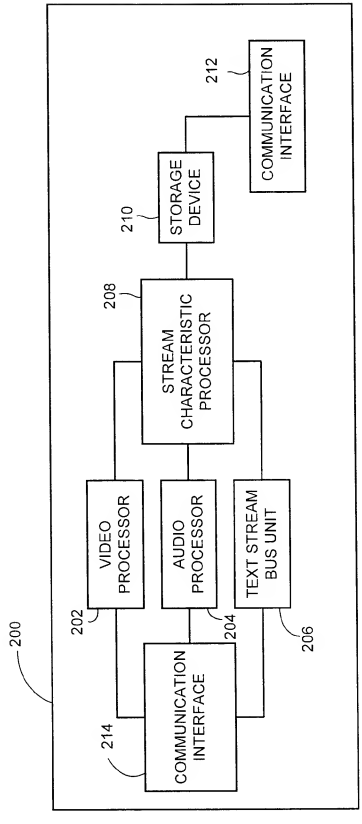

200
VIDEO PROCESSOR
202
AUDIO PROCESSOR
204
TEXT STREAM BUS UNIT
206
STREAM CHARACTERISTIC PROCESSOR
208
STORAGE DEVICE
210
COMMUNICATION INTERFACE
212
COMMUNICATION INTERFACE
214

FIG. 5

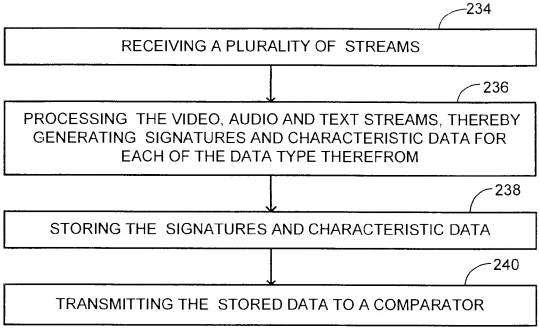

234
RECEIVING A PLURALITY OF STREAMS
236
PROCESSING THE VIDEO, AUDIO AND TEXT STREAMS, THEREBY GENERATING SIGNATURES AND CHARACTERISTIC DATA FOR EACH OF THE DATA TYPE THEREFROM
238
STORING THE SIGNATURES AND CHARACTERISTIC DATA
240
TRANSMITTING THE STORED DATA TO A COMPARATOR

FIG. 6

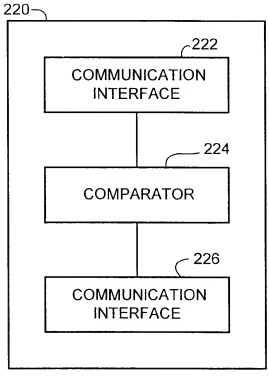

220
222
COMMUNICATION INTERFACE
224
COMPARATOR
226
COMMUNICATION INTERFACE

Fig. 7

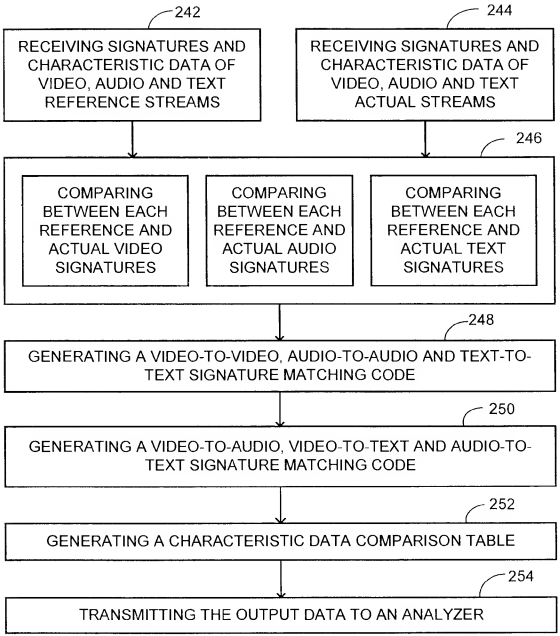

242
RECEIVING SIGNATURES AND CHARACTERISTIC DATA OF VIDEO, AUDIO AND TEXT REFERENCE STREAMS
244
RECEIVING SIGNATURES AND CHARACTERISTIC DATA OF VIDEO, AUDIO AND TEXT ACTUAL STREAMS
246
COMPARING BETWEEN EACH REFERENCE AND ACTUAL VIDEO SIGNATURES
COMPARING BETWEEN EACH REFERENCE AND ACTUAL AUDIO SIGNATURES
COMPARING BETWEEN EACH REFERENCE AND ACTUAL TEXT SIGNATURES
248
GENERATING A VIDEO-TO-VIDEO, AUDIO-TO-AUDIO AND TEXT-TO-TEXT SIGNATURE MATCHING CODE
250
GENERATING A VIDEO-TO-AUDIO, VIDEO-TO-TEXT AND AUDIO-TO-TEXT SIGNATURE MATCHING CODE
252
GENERATING A CHARACTERISTIC DATA COMPARISON TABLE
254
TRANSMITTING THE OUTPUT DATA TO AN ANALYZER

FIG. 8

DATA TYPES ON COMPARATOR INPUT
260
VIDEO REFERENCE
SIGNATURE
CHARACTERISTIC DATA:
TIME/DATE MARKER
PROVIDER ID
DURATION
INITIAL RATING
CONTENT CODE
262
VIDEO ACTUAL
SIGNATURE
CHARACTERISTIC DATA:
TIME/DATE MARKER
CHANNEL ID
DURATION
264
AUDIO/TEXT REFERENCE
SIGNATURE
CHARACTERISTIC DATA:
TIME/DATE MARKER
PROVIDER ID
DURATION
INITIAL RATING
CONTENT CODE
266
AUDIO/TEXT ACTUAL
SIGNATURE
CHARACTERISTIC DATA:
TIME/DATE MARKER
CHANNEL ID
DURATION
LANGUAGE

FIG. 9

VIDEO/AUDIO/TEXT	SIGNATURE MATCHING CODE
VIDEO - AUDIO	MATCHING CODE
VIDEO - TEXT	MATCHING CODE
AUDIO - TEXT	MATCHING CODE
VIDEO/AUDIO/TEXT	TIME SHIFT
VIDEO/AUDIO/TEXT	CHARACTERISTIC DATA COMPARISON TABLE

FIG. 10

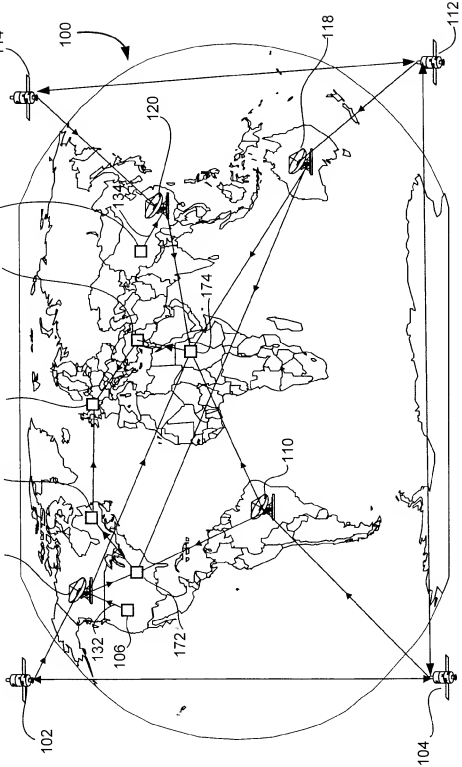

100
102
104
106
108
110
112
114
116
118
120
132
134
172
174
176A
176B
178

FIG. 11

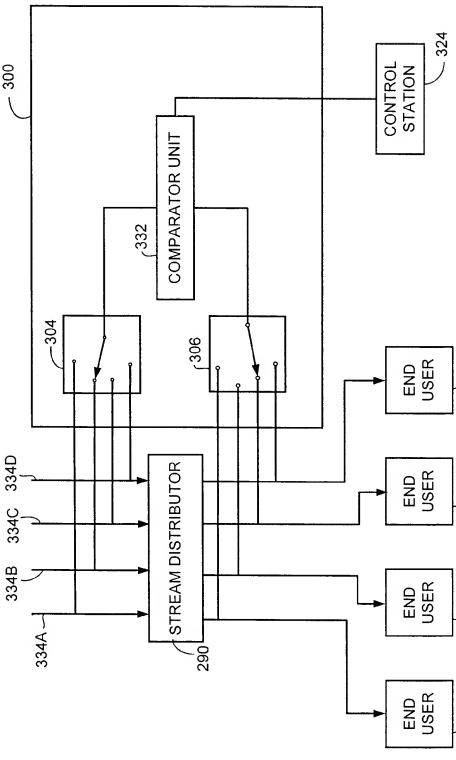

300
CONTROL STATION
324
COMPARATOR UNIT
332
304
306
334D
334C
334B
334A
STREAM DISTRIBUTOR
290
END USER
302D
END USER
302C
END USER
302B
END USER
302A

FIG. 12

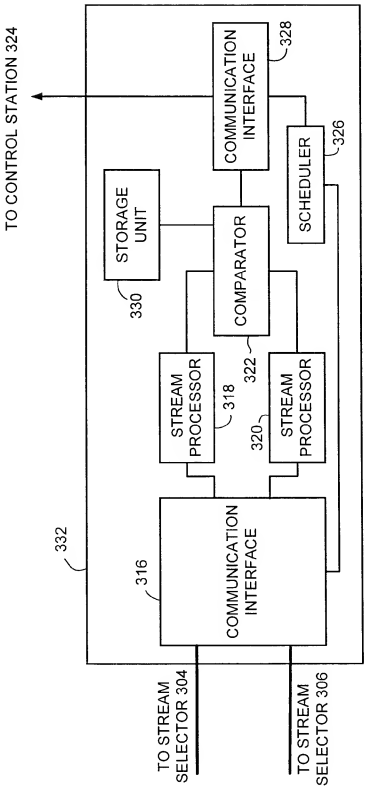

TO CONTROL STATION 324
332
316
COMMUNICATION INTERFACE
STREAM PROCESSOR
318
320
STREAM PROCESSOR
322
COMPARATOR
STORAGE UNIT
330
SCHEDULER
326
COMMUNICATION INTERFACE
328
TO STREAM SELECTOR 304
TO STREAM SELECTOR 306

Fig. 13

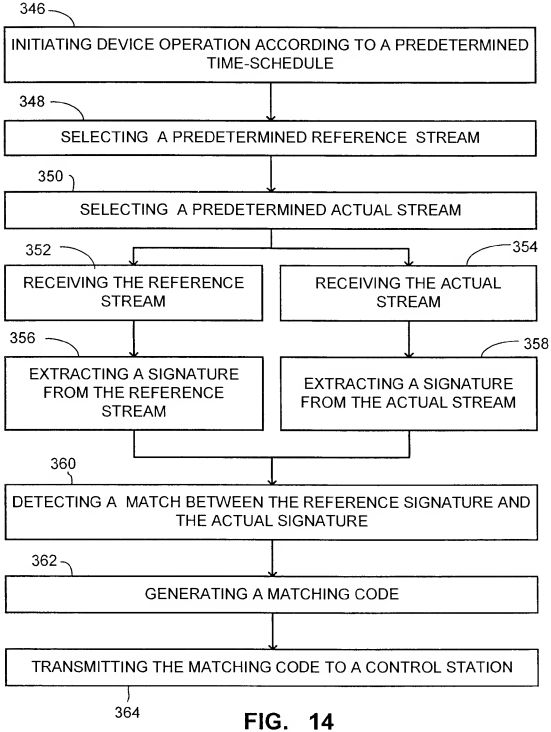

346
INITIATING DEVICE OPERATION ACCORDING TO A PREDETERMINED TIME-SCHEDULE
348
SELECTING A PREDETERMINED REFERENCE STREAM
350
SELECTING A PREDETERMINED ACTUAL STREAM
352
RECEIVING THE REFERENCE STREAM
354
RECEIVING THE ACTUAL STREAM
356
EXTRACTING A SIGNATURE FROM THE REFERENCE STREAM
358
EXTRACTING A SIGNATURE FROM THE ACTUAL STREAM
360
DETECTING A MATCH BETWEEN THE REFERENCE SIGNATURE AND THE ACTUAL SIGNATURE
362
GENERATING A MATCHING CODE
TRANSMITTING THE MATCHING CODE TO A CONTROL STATION
364

FIG. 14

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IL00/00719

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : H04N 11/20, 7/00, 11/00, 7/16, 7/173; H04H 9/00
US CL : 348/460; 725/19, 22, 116

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 348/460; 725/19, 22, 116

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4,805,020 A (GREENBERG) 14 February 1989.	1-66
A	US 5,436,653 A (ELLIS et al.) 25 July 1995.	1-66
A	US 4,945,412 A (KRAMER) 31 July 1990	1-66

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search 02 APRIL 2001	Date of mailing of the international search report 26 APR 2001
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer HAI VAN TRAN Telephone No. (703) 308-0000

Form PCT/ISA/210 (second sheet) (July 1998)★